UNDERSTANDING CELL COMMUNICATION

DISCUSSIONS AND HOW OUR PROJECT CONTRIBUTES TO THIS APPLICATION

An organism's behaviour can be driven by interactions with the environment and other organisms via communication through sending chemical signals, or through physical interactions. A fundamental question to understand behaviour and social interactions is to consider the mechanism of communication between organisms. The ability to place cells at certain distances

Currently, signalling pathways can be explored experimentally by placing an organism of study within a chamber and flowing the signal through the chamber creating a gradient. In yeast, pheromone signal systems are being analysed in this way by releasing a caged molecule that can then be released using photolysis.

Organisms need to find nutrients in the environment and one way this can occur is through chemotaxis. Microorganisms can sense nutrients in the environment and move towards them. Dictoseylium, also known as the slime mould, release cAMP when starved. When cAMP is detected cells respond by moving towards the signal and aggregating to form a colony. Within a flow chamber researchers can visualize cells which are labelled with fluorescent markers to view how the cell behaves and moves in response to the signal. An issue that is brought up in studies similar to this is that it would be better to have cells adhered to different distances to the source and analyse these cells. Currently one method to stick this is to coat the cells with an adhesion molecule.

Our concept is aimed at attaching cells, so this would help to resolve this by adhering a cell to DNA which can be placed precisely using a robot at specific distances along a signal gradient. In the system of Dictoseylium the genome has been sequenced and it is often used as a model organism so this has the potential to be genetically modified to express the surface zinc fingers that would allow the cells to be attached in precise positions.

The use of sticking cells at a single cell level would be very beneficial to looking at cell to cell signaling. Two cells could begin side by side and in different scenarios be moved further apart by the placement of DNA on a substrate. A signal could then be given to one of the cells, and the response of the second could be viewed so see the mechanism of cell signaling and how far a diffusion gradient is.